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period of three hours. It is perhaps of interest to note that it is customary for the Filipinos to sleep on a mat which is spread upon the floor. On December 21 one of the guinea pigs died of typical plague, the diagnosis being bacteriologically confirmed. A most careful search was made of the pigs for fleas after the cage was removed, but none could be found.

A similar experiment was carried on in a house on Calle Cabildo, and another in a house on Calle San Fernando, in both of which human cases of plague had occurred. Before the cages were placed, however, the routine disinfection measures of the bureau of health, which consist of spraying with kerosene and thorough washing down with a larvicide, were carried out. In neither of these instances did the guinea pigs contract plague. From the foregoing it would appear that the insecticidal and disinfecting measures as carried out in Manila are effective.

PELLAGRA.

A REPORT ON ITS EPIDEMIOLOGY.

By R. M. GRIMM, Passed Assistant Surgeon, United States Public Health Service.

The following article is a report upon pellagra field work undertaken during the summers of 1911 and 1912 under the orders of the Surgeon General of the United States Public Health Service. Some of the data collected in this work has been previously reported, but it was thought well to bring together into one article all of the data collected in my epidemiological work up to the present time. This report is intended to be mainly a presentation of facts as recorded during the study of the disease from the standpoint of its epidemiology.

The method followed in the work was to visit pellagrous communities and interview the health officers and local physicians. With their assistance data were collected by interviewing pellagrins, by taking reports of cases and deaths, and by getting reports of facts or conditions pertaining to the disease in the various communities. Whenever possible the pellagrins were visited at their homes in company with the family physician, and during these visits notes were taken upon the home environment of the pellagrins and upon any condition which seemed to have a probable bearing on the disease. For each case a 5 by 8 inch card was used. This was found to be fairly satisfactory for recording and filing the data. In all, 25 counties were visited—3 in Kentucky, 7 in South Carolina, and 15 in

Georgia. Some 200 or more physicians were interviewed and data obtained relating to a total of 1,426 cases. Two hundred and ninety-six pellagrous homes were personally visited and 323 pellagrins personally interviewed.¹

The facts that apply to the total number of cases will be taken up first; next, the additional facts that pertain to the cases personally seen will be given; finally, there will be presented a brief description of the districts visited, with a more or less full account of the pellagra situation in communities found in three of these districts.

CONSIDERATION OF THE TOTAL NUMBER OF CASES.

Distribution of cases.—The total number of cases, including cases and deaths reported and cases personally seen, were distributed among the three States as follows:

States.	Cases seen.	Nonfatal cases reported.	Fatal cases reported.	Total cases.
Kentucky.....	38	64	18	120
South Carolina.....	161	441	252	854
Georgia.....	124	167	161	452
Total.....	323	672	431	1,426

These figures can not be considered as indicating comparative prevalence of the disease in the three States, as they are in proportion to the lengths of time spent in each State, and are not in proportion to the number of counties visited nor to the territory covered.

Race and sex.—The number of cases and deaths in the series is shown in the following table according to race and sex:

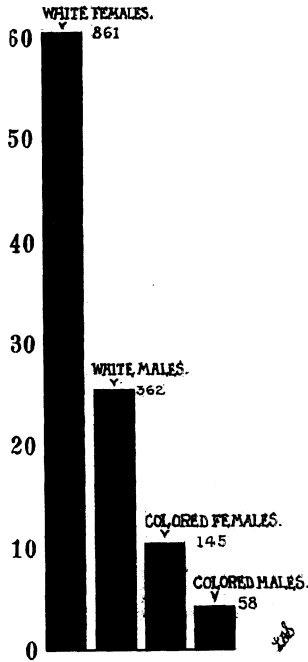
	Nonfatal cases seen and reported.	Fatal cases reported.	Total.	Percentage of aggregate.
White females.....	620	241	861	60.4
White males.....	268	94	362	25.3
Colored females.....	71	74	145	10.2
Colored males.....	36	22	58	4.1
Total.....	995	431	1,426	100.0

The accompanying chart (Chart 1), which is constructed from the column of percentages in the above table, shows in a graphic way the

¹ The cases which are considered in this report are made up of the cases of three series, designated for the sake of reference "WKB," "SCY," and "SCG." When reference is made to individual cases the name of the series and the number of the case in its series are both given.

difference in the numbers of cases in each race-sex group of the cases in this series.

CHART 1



SHOWING THE RELATIVE NUMBERS OF WHITE FEMALES, WHITE MALES, COLORED FEMALES, AND COLORED MALES IN THE TOTAL NUMBER OF 1,426 CASES.

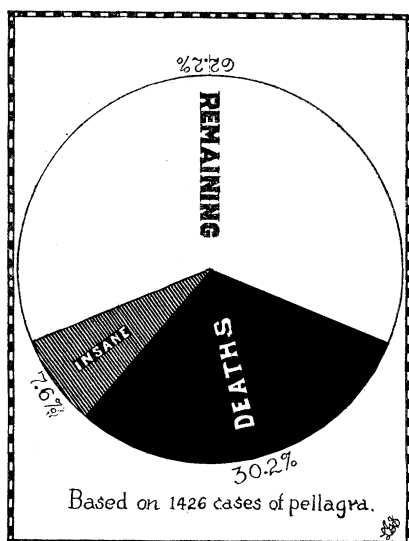
In considering these results it must be remembered that this series of cases was collected in States where a large proportion of the population is colored and that in some of the communities visited the negroes equal or probably outnumber the whites. The possibility that the negroes do not become ill enough from the disease to consult a physician does not seem sufficiently strong to explain this difference. In the districts which I visited pellagra seemed to spare the negro to a remarkable extent, and it was not unusual to find a physician who, although he had seen many cases of pellagra among the whites, had never seen one among the blacks. Once attacked, however, as will be seen below where insanity incidence and mortality rates are considered, negroes seem to be treated less kindly by pellagra than are the whites. The great preponderance in both races of affected females over males is another fact which so far is wanting a satisfactory explanation.

Case mortality rate and insanity incidence.—In the table given below there is grouped with reference to race and sex the total number of

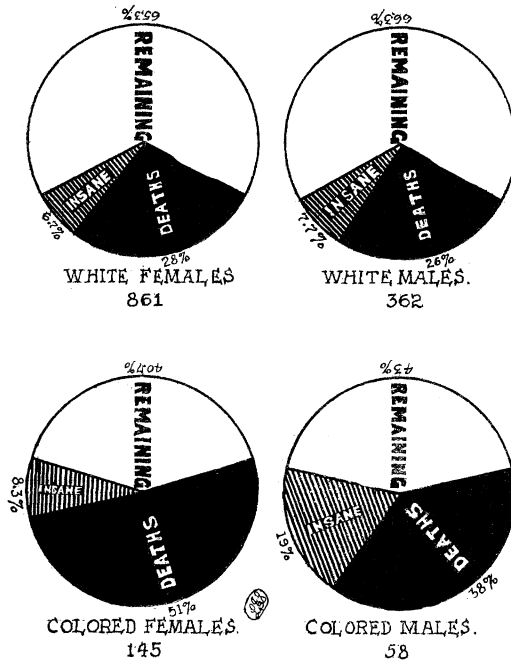
cases, the number of deaths, and the number of insane cases in the whole series. Only the deaths and cases of insanity in pellagra which were reported to me by the physicians in the districts visited have been included here, since to have included the many cases seen at the State asylums of South Carolina and Georgia would have given erroneous results with reference to insanity incidence. The rates of case mortality and of insanity incidence for each race-sex group have been calculated and appear in the two columns so designated. The aggregates appear at the foot of each column.

The case mortality rate and the rate of insanity incidence for the whole series of 1,426 cases and for each race-sex group is expressed graphically by charts (Charts 2, 3, and 4). In Chart 2 the total of 1,426 cases is taken as 100 per cent, and in Chart 3 the total number of cases in each race-sex group is taken as 100 per cent. The portions indicating the deaths and insane cases have been measured off in accordance with the percentages in the columns of mortality rate and insanity incidence. Chart 4 shows the proportional parts formed by the death and insane cases in each race-sex group compared absolutely with the same proportional parts in the other race-sex groups.

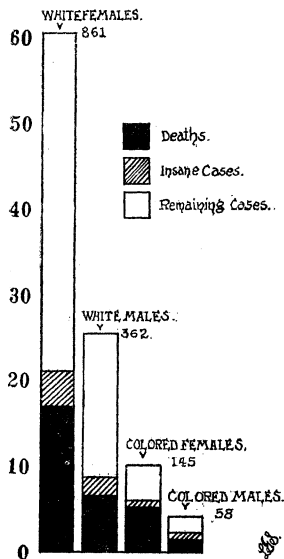
CHART 2



SHOWING THE PERCENTAGES OF THE TOTAL NUMBER OF CASES FORMED BY THE DEATHS AND INSANE CASES.

CHART 3**INSANE CASES AND DEATHS BY RACE AND SEX.**

SHOWING THE PERCENTAGES IN EACH RACE-SEX GROUP FORMED BY THE DEATHS AND INSANE CASES.

CHART 4

SHOWING THE ABSOLUTE COMPARISON OF THE NUMBER OF DEATHS AND INSANE CASES IN EACH RACE-SEX GROUP WITH THOSE IN THE OTHERS.

	Total cases.	Deaths.	Insane cases.	Case mortality rate.	Case insanity rate.
White females.....	861	241	58	<i>Per cent.</i> 28	<i>Per cent.</i> 6.7
White males.....	362	94	28	26	7.7
Colored females.....	145	74	12	51	8.3
Colored males.....	58	22	11	38	19.0
Total.....	1,426	431	109	30.2	7.6

Age.—In considering the subject of age, the white females, the white males, the colored females, and the colored males are taken up separately. The cases in each race-sex group are collected into 5-year age groups according to age. In the tables which follow there are shown in the various columns the total number of cases, the number of reported deaths, and the number of insane pellagrins in each age group for each race-sex group. The case fatality rates and the rates of insanity incidence for the age groups have not been calculated on account of the small number of cases in some of them. In the charts which accompany these tables (Charts 5, 6, 7, 8, and 9), there are shown for each race-sex group age, curves for the total number, for the deaths, and for the insane cases. In each curve the ordinate measures the number of cases and the abscissa the years of age. The charts are merely graphic representations of the results shown in the tables.

All of the white female cases in the series are grouped in the following table according to age:

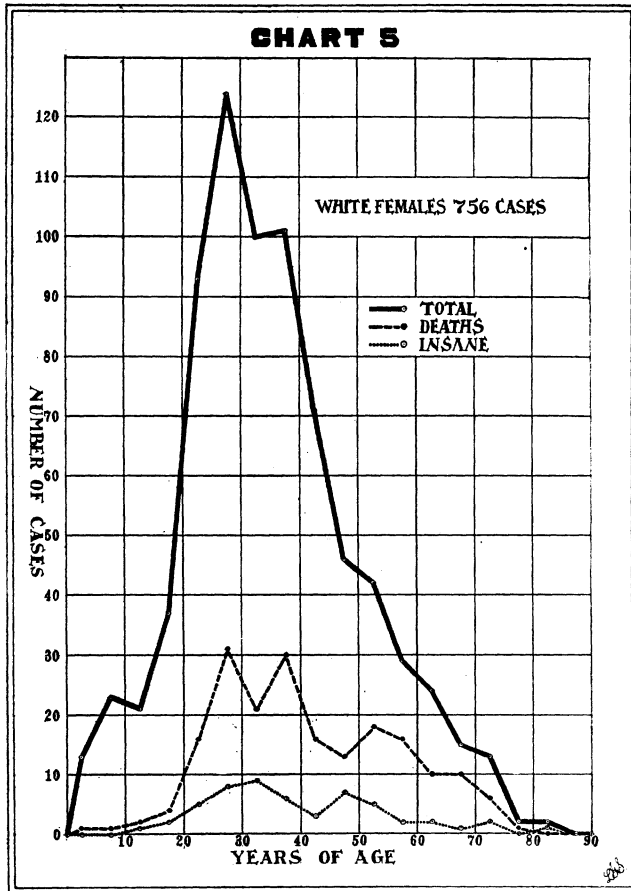
Age table of white female cases.

Ages in years.	Cases.	Deaths.	Insane.	Ages in years.	Cases.	Deaths.	Insane.
0 to 14.....	13	1	.....	55 to 59.....	29	16	2
5 to 9.....	23	1	.....	60 to 64.....	24	10	2
10 to 14.....	21	2	1	65 to 69.....	15	10	1
15 to 19.....	37	4	2	70 to 74.....	13	6	2
20 to 24.....	93	16	5	75 to 79.....	2	1	.....
25 to 29.....	124	31	8	80 to 84.....	2	.....	1
30 to 34.....	100	21	9	Above 84.....	.....	.....	.....
35 to 39.....	101	30	6	Age not reported...	105	45	4
40 to 44.....	71	16	3				
45 to 49.....	46	13	7				
50 to 54.....	42	18	5	Total.....	861	241	58

¹ This age group includes those up to the end of the fifth year of life.

² This age group includes those from the beginning of the sixth to the end of the tenth year of life

These figures are expressed graphically in the form of curves in Chart 5. Necessarily only the cases in which the age was determined have been used in constructing the curves.

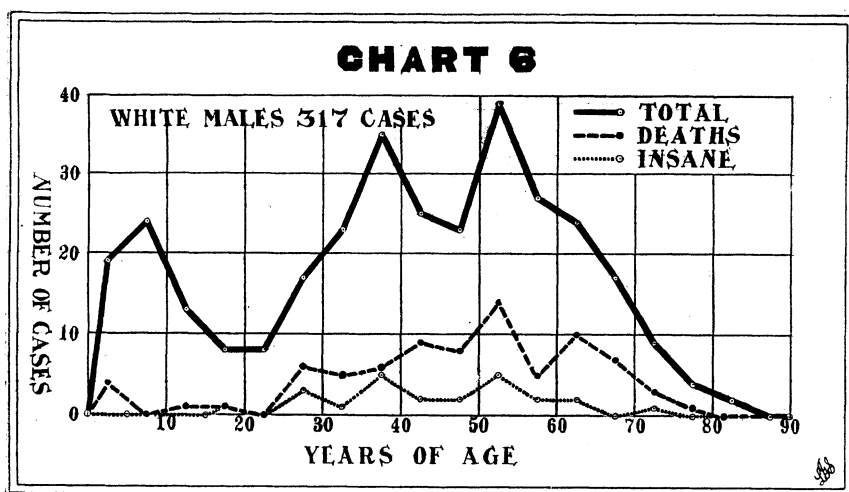


SHOWING FOR WHITE FEMALE PELLAGRINS THE AGGREGATE AGE CURVE OF ALL PATIENTS, OF THE DEAD, AND OF THE INSANE.

Age table of white male cases.

Ages in years.	Cases.	Deaths.	Insane.	Ages in years.	Cases.	Deaths.	Insane.
0 to 4.....	19	4	.....	55 to 59.....	27	5	2
5 to 9.....	24	.....	.....	60 to 64.....	24	10	2
10 to 14.....	13	1	.....	65 to 69.....	17	7	.....
15 to 19.....	8	1	1	70 to 74.....	9	3	1
20 to 24.....	8	.....	.....	75 to 79.....	4	1	.....
25 to 29.....	17	6	3	80 to 84.....	2	.....	.....
30 to 34.....	23	5	1	Above 84.....	.....	.....	.....
35 to 39.....	35	6	5	Age not reported...	45	14	4
40 to 44.....	25	9	2				
45 to 49.....	23	8	2				
50 to 54.....	39	14	5				
				Total.....	362	94	28

These numbers are expressed in the form of curves in Chart 6.

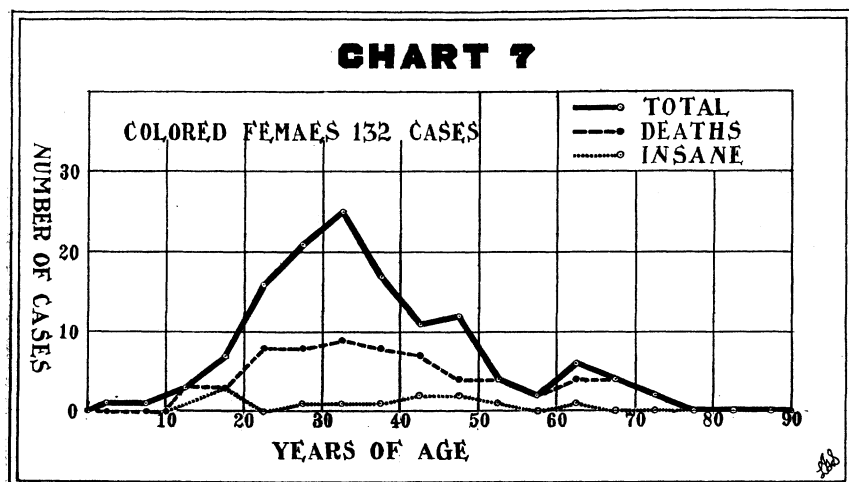


SHOWING FOR WHITE MALE PELLAGRINS THE AGGREGATE AGE CURVE OF ALL PATIENTS, OF THE DEAD, AND OF THE INSANE.

Age table of colored female cases.

Ages in years.	Total cases.	Deaths.	Insane.	Ages in years.	Total cases.	Deaths.	Insane.
0 to 4.....	1	.....	.....	55 to 59.....	2	2	.....
5 to 9.....	1	.....	.....	60 to 64.....	6	4	1
10 to 14.....	3	3	.....	65 to 69.....	4	4	.....
15 to 19.....	7	3	3	70 to 74.....	2	2	.....
20 to 24.....	16	8	.....	75 to 79.....	.....	.....	.....
25 to 29.....	21	8	1	80 to 84.....	.....	.....	.....
30 to 34.....	25	9	1	Above 84.....	.....	.....	.....
35 to 39.....	17	8	1	Age not reported...	13	8	.....
40 to 44.....	11	7	2	Total.....	145	74	12
45 to 49.....	12	4	2				
50 to 54.....	4	4	1				

These numbers have also been expressed in the form of curves in Chart 7.

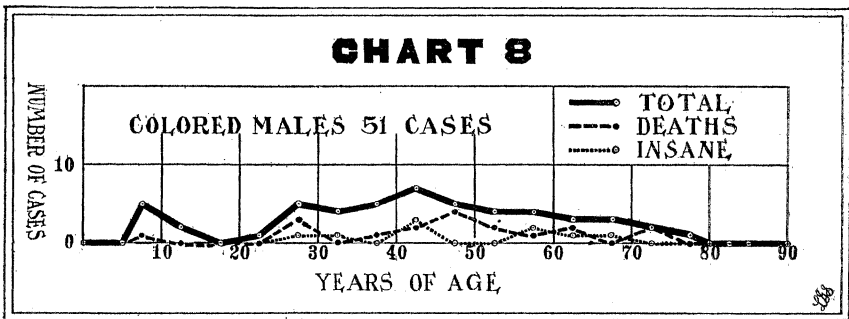


SHOWING FOR COLORED FEMALE PELLAGRINS THE AGGREGATE AGE CURVE OF ALL PATIENTS, OF THE DEAD, AND OF THE INSANE.

Age table of colored male cases.

Ages in years.	Total cases.	Deaths.	Insane.	Ages in years.	Total cases.	Deaths.	Insane.
0 to 4.....	.....	.....	.....	55 to 59.....	4	1	2
5 to 9.....	5	1	.....	60 to 64.....	3	2	1
10 to 14.....	2	.....	.....	65 to 69.....	3	.....	1
15 to 19.....	.....	.....	.....	70 to 74.....	2	2	.....
20 to 24.....	1	.....	.....	75 to 79.....	1	.....	.....
25 to 29.....	5	3	1	80 to 84.....	.....	.....	.....
30 to 34.....	4	.....	1	Above 84.....	.....	.....	.....
35 to 39.....	5	1	.....	Age not reported...	7	4	2
40 to 44.....	7	2	3	Total.....	58	22	11
45 to 49.....	5	4	.....			
50 to 54.....	4	2	.....			

Curves which express these results are also shown in Chart 8.

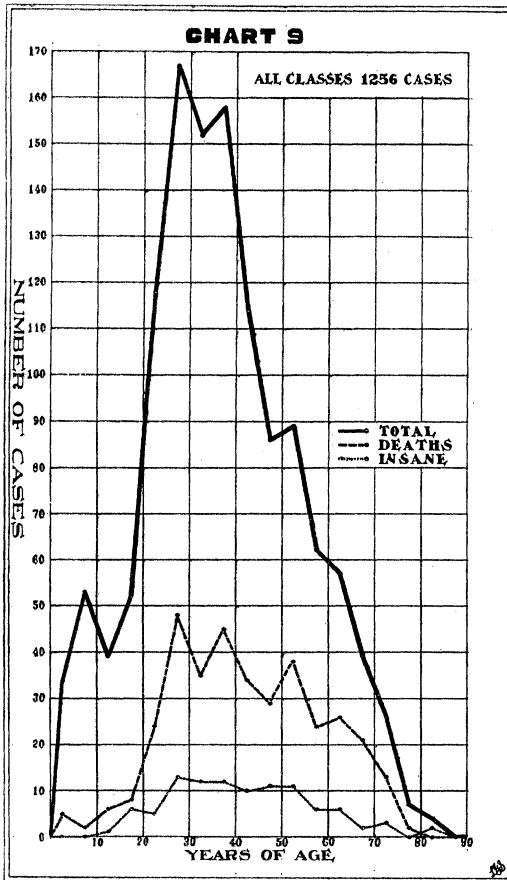


SHOWING FOR COLORED MALE PELLAGRINS THE AGGREGATE AGE CURVE OF ALL PATIENTS, OF THE DEAD, AND OF THE INSANE.

In like manner the total number of cases, the total number of deaths, and the total number of insane cases for the whole series have been grouped into age groups and are shown in the following table. This table is, of course, merely the combination of the above four tables of the race-sex groups. The numbers in this table have also been expressed graphically by curves in Chart 9.

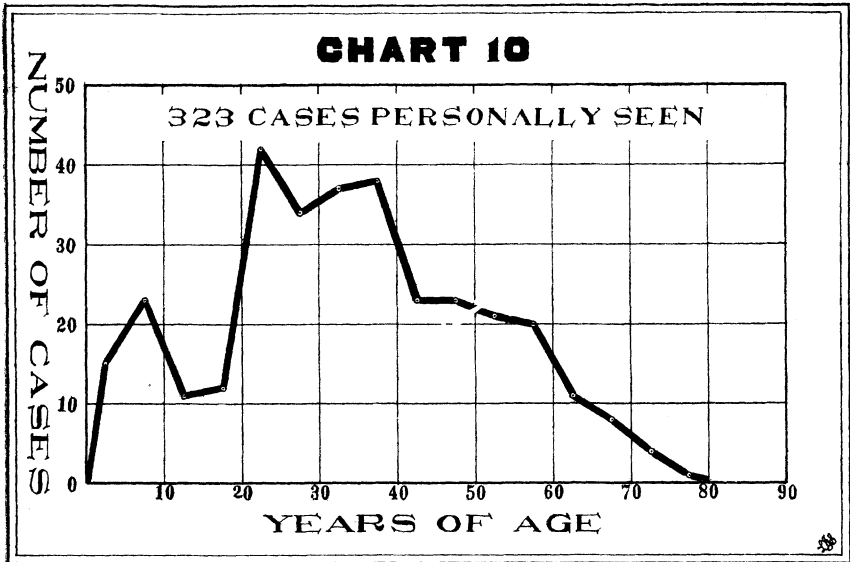
Age table of all cases.

Ages in years.	Total of series.	Total number of deaths.	Total number of insane cases.	Ages in years.	Total of series.	Total number of deaths.	Total number of insane cases.
0 to 4.....	33	5	.....	55 to 59.....	62	24	6
5 to 9.....	53	2	.....	60 to 64.....	57	26	6
10 to 14.....	39	6	1	65 to 69.....	39	21	2
15 to 19.....	52	8	6	70 to 74.....	26	13	3
20 to 24.....	118	24	5	75 to 79.....	7	2	.....
25 to 29.....	167	48	13	80 to 84.....	4	.....	1
30 to 34.....	152	35	12	Above 84.....	.....	.....	.....
35 to 39.....	158	45	12	Age not reported...	170	71	10
40 to 44.....	114	34	10	Total.....	1,426	431	109
45 to 49.....	86	29	11				
50 to 54.....	89	38	11				



SHOWING FOR PELLAGRINS OF THE ENTIRE SERIES IN WHICH AGE WAS DETERMINED THE AGGREGATE AGE CURVE OF ALL PATIENTS, OF THE DEAD, AND OF THE INSANE.

As has been said, 323 of the cases in this series were personally seen. The age was determined in each case and these ages have been combined into a curve (Chart 10), as in the above charts. These cases have been considered here separately from the reported cases, because the ages of these cases were more accurately determined than the ages of those cases not personally seen.



SHOWING AGE CURVE OF THE 323 CASES PERSONALLY SEEN.

Marital condition.—The marital condition of the 323 cases personally seen was determined as follows:

Single, males 43, females 40, total 83.

Married, males 50, females 158, total 208.

Widowed, males 7, females 25, total 32.

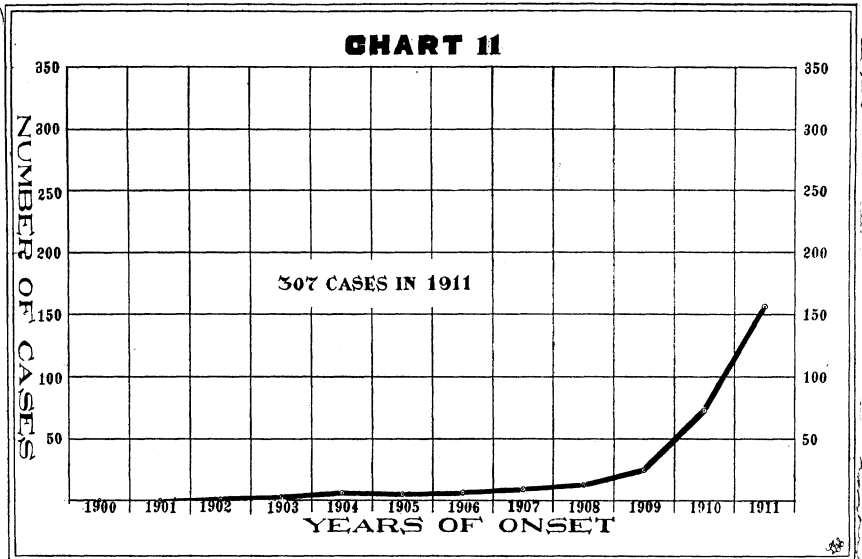
Date of onset.—The approximate date of onset of the first attack of the disease was determined in practically all of the cases personally seen and in most of those reported to me. The exact date, as the week or even the month, could not be learned in all of the cases, since the onset of pellagra is quite often a very gradual one. It was thought that by determining the number of new cases for the various years, even only in an incomplete way, some idea might be obtained of the rate of increase of pellagra in the districts which were visited. The number of cases in the series having the onset in the various years is given below. The dates given are those when a positive diagnosis was or could have been made from the signs and symptoms

described. The cases collected in 1911 and those collected in 1912 are listed separately in the following table:

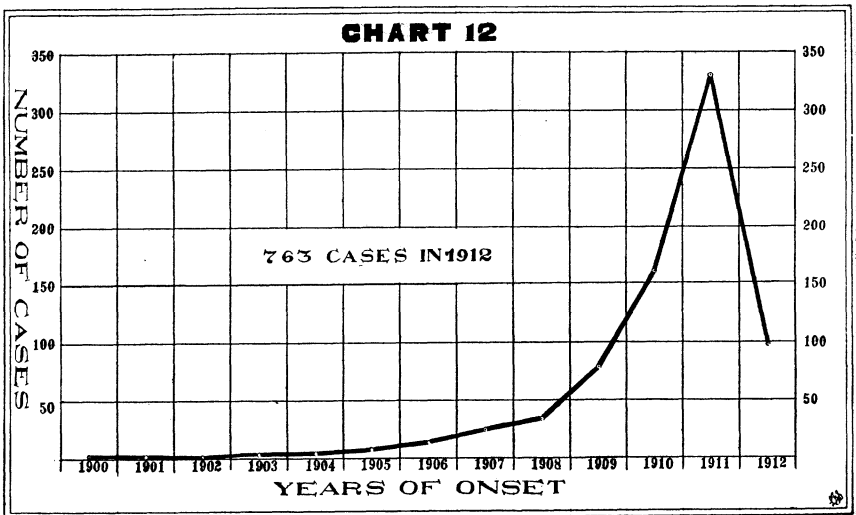
Table showing years of onset of the disease in the pellagrins considered in this report.

Years of onset.	Cases collected in 1911.			Cases collected in 1912.		
	Seen.	Reported.	Total.	Seen.	Reported.	Total.
1912.....				53	46	99
1911.....	65	91	156	86	244	330
1910.....	30	44	74	29	133	162
1909.....	7	23	30	21	58	79
1908.....	8	5	13	5	29	34
1907.....	3	6	9	2	23	25
1906.....	2	5	7	1	13	14
1905.....	3	2	5		7	7
1904.....		6	6		4	4
1903.....		3	3		3	3
1902.....	1		1		1	1
1901.....					1	1
1900.....				1	1	2
1897 (?).....		1	1		1	1
1893 (?).....		2	2			
1886 (?).....					1	1
Undetermined.....	2	191	193	4	159	163
Total.....	121	379	500	202	724	926

The numbers in the column of totals for the cases collected in 1911 and for those collected in 1912 are shown graphically in Charts 11 and 12. In 1911 I left the field on October 30, and in 1912 the work was concluded September 1. This may account in part, at least, for the drop in the number of collected cases having their onset in 1912, since other cases may have developed after I had left the districts. It seemed, however, from the reports of the local physicians that the prevalence of pellagra in the districts visited reached a high-water mark in 1911, and that more new cases came to their attention in that year than in previous years and fewer in 1912 than in 1911.



SHOWING YEARS OF ONSET OF THE CASES COLLECTED IN 1911.



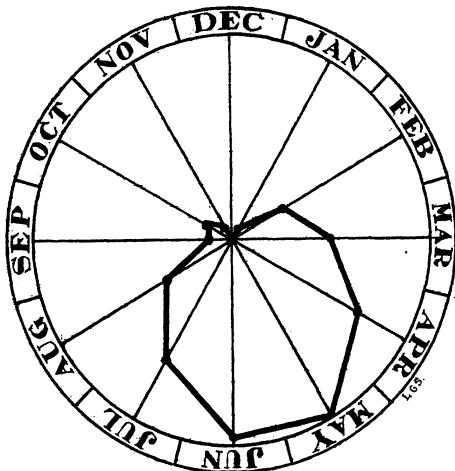
SHOWING YEARS OF ONSET OF CASES COLLECTED IN 1912.

The month of onset was determined with a fair degree of accuracy in 181 of the cases personally seen. The numbers of cases having their onset in the several months are listed below:

Month of onset.	Number of cases.	Month of onset.	Number of cases.
January.....	2	July.....	25
February.....	11	August.....	14
March.....	18	September.....	4
April.....	27	October.....	5
May.....	37	November.....	2
June.....	36	December.....	

These results may be expressed graphically by a curved line which connects points on radii of a circle at distances from the center proportional to the number of cases for the various months of the year.

CHART 13



**INCIDENCE .
181 CASES .**

SHOWING MONTHS OF ONSET OF 181 CASES

CONSIDERATION OF CASES PERSONALLY SEEN.

As has been said, 296 pellagrous homes were personally visited and 323 pellagrins personally interviewed. The conditions under which these visits were necessarily made precluded complete clinical histories, so aside from getting clinical data sufficient for a positive diagnosis the time was spent largely in obtaining data on epidemiology. Attention was paid to the general character of the classes of people suffering from the disease, to occupation and economic circumstances; also to location and sanitary conditions of the homes. Food and water supplies were investigated in a superficial way. An attempt was also made to discover any possible relationship of the cases to other cases. On account of the nomadic character of the majority of the pellagrins visited, it was difficult, and practically impossible in many instances, to learn anything exact concerning the environment and conditions under which the disease had developed.

Occupation.—Generally speaking the majority of the pellagrins who were personally seen belonged to families with small incomes and their general environment and living conditions were much below even a moderate standard. Most of them seemed to be living a hand-to-

mouth existence, depending for their support upon what they earned from day to day. Cases were seen, however, among the well to do, who had developed the disease under conditions and living environment which apparently seemed above criticism. Some idea of the general status of the people represented in the series may be had by a consideration of the rather detailed classification of occupations constituting the source of the family income given below:

A. Factory:		E. Clerical pursuits:	
1. Cotton mill—		1. Grocery and general merchandise store—	
Men.....	29	Men.....	5
Women.....	91	Women.....	4
Children.....	18	Children.....	4
2. Excelsior mill—		2. Office workers.....	2
Men.....	1	3. Real estate agent's wife.....	1
Women.....	3	4. Itinerant agent.....	1
Children.....	2	5. Bank clerk's child.....	1
3. Chair factory—		Total for clerical pursuits.....	18
Women.....	2		
4. Lumber mill—		Railroad employment:	
Men.....	1	Men.....	2
Women.....	1	Women.....	1
Total for factory.....	148	Children.....	2
		Total for railroad employment.....	5
B. Mining:		Professional work:	
1. Coal—		1. Physician.....	1
Men.....	5	2. Druggist's wife.....	1
Women.....	14	3. Clergy—	
Children.....	6	Men.....	1
2. Metal—		Women.....	1
Women.....	1	Children.....	1
Total for mining.....	26	Total for professional work.....	5
C. Agriculture:		Without occupation:	
Men.....	12	1. Convicts.....	2
Women.....	29	2. Idiots.....	2
Children.....	7	3. Vagrants.....	1
Total for agriculture.....	48	Total without occupation.....	5
D. Trade:		Miscellaneous:	
1. Machinist—		1. Laboring—	
Men.....	2	Men.....	2
Women.....	1	Women.....	33
Children.....	5	Children.....	2
2. Carpenter—		2. Domestic servants.....	2
Men.....	4	3. R. F. D. carrier—	
Women.....	3	Men.....	1
3. Blacksmith—		Women.....	1
Men.....	1	Children.....	1
Women.....	1	4. Foreman (road work).....	1
Children.....	1	5. Liveryman.....	1
4. Plumber—		6. Gin-saw filer.....	1
Men.....	1	Total for miscellaneous.....	45
Women.....	1		
5. Painters.....	1		
6. Marble cutters.....	1		
7. Slate workers.....	1		
Total for trade.....	23		

The cotton mill workers as a class seemed to be poor, overworked and underfed. They were found living in cottages located around the mills in which they worked. Very few of them own their homes, but live in houses built and owned by the milling companies. Some of these cotton mill villages are located in comparatively isolated spots, but as a rule they were found located near or in the suburbs of a town, and in some instances form a part of a town or city. The general sanitation of these villages is usually well looked after by the milling companies and in many instances the little villages presented

a very attractive appearance. The authority of the companies, however, does not seem to extend to the interior of the homes of their employees, where in the majority of those visited were found evidences of poverty and of extreme neglect. With few exceptions the homes which were visited among this class of people showed bad house sanitation, and in very few of them was it evident that cleanliness and care had received much consideration in the scheme of housekeeping. As a rule little attention seemed to have been paid either to house or to personal hygiene, so that in most instances the general picture presented by these homes and their occupants was one of shiftlessness and negligence. The total earnings of the working members of some of the families seemed quite sufficient for comfortable living, but as a rule they did not seem to understand the art of applying this income toward the improvement of their living conditions.

The general environment and living conditions found among the coal miners were as bad as if not worse than those found among the cotton mill people. The coal mining camps visited were comparatively isolated and were in need of the requisites of proper sanitation.

The conditions found in the camps which were visited indicated a general lack of interest in sanitary matters. One of these camps was having a small epidemic of typhoid fever at the time of my visit. The conditions of living in these camps are continually improving, however, as the mine operators are keenly interested in the health of their employees and are on the lookout to improve conditions whenever possible. These people are continually trying their fortune first in one camp and then in another, and if they are not moving from one camp to another they are moving from house to house in the same camp. Comparatively few of the pellagrins who were visited among this class were found living at the home where they developed the first symptoms of the disease. The interior of these homes was no improvement upon the conditions found among the cotton-mill people.

The 48 pellagrins of the agricultural class were nearly all of the class of "renters" or "croppers," who remain at one place only long enough to cultivate a crop of cotton before moving to the next. A few of them were small landowners, but many were typical "Georgia crackers," and were found living in an environment of poverty and bad hygiene.

Entomology.—From the standpoint of entomology the great majority of the pellagrous homes visited in this work would without doubt have furnished interesting material for study. The ordinary bed bug was collected from several of the houses, was acknowledged to be present in others, and in very few of the homes visited were conditions such as to lead one to suspect the absence of this and of other ectoparasites of man. It was the exception to find a pellagrin living

in a screened house, although mosquitoes were said to be present in all of the districts visited. Malarial fever was reported to be common in some of these districts, but in others it was said to be practically unknown. Quite a number of the pellagrins gave a previous history of malarial infection. The ordinary house fly was present in practically all of the homes and in many of those where a pellagrin was confined to bed these flies were especially numerous. The granaries from which corn had been obtained for two families living in the country were inspected and found to be heavily infested with weevils and moths. From one granary corn had been obtained for a family of 9 members among whom 1 case of pellagra had developed (case SCG 105); from the other, corn for a family of 6 members among whom 3 cases of pellagra had developed (cases SCG 75, 76, and 77). In a number of the communities which were visited the presence of the fly *Simulium*, sometimes in close association with cases of pellagra, was demonstrated by Messrs. Jennings and King, of the Bureau of Entomology, United States Department of Agriculture, but this fly was not looked for in all of the districts.

Location of homes.—The cases of pellagra in this series were found to have developed in the mountainous sections of southeastern Kentucky and of northwest Georgia; in the rolling upland regions of western South Carolina and middle Georgia; and in the lowlands of south Georgia. More of these cases were collected from the rolling sections than from either the mountainous or low country. The climate of the districts which were visited varies from temperate and never extreme in the mountains to subtropical in the southern portion of Georgia. With reference to elevation, cases were found to have developed at practically all elevations from 1,000 feet down to only a few feet above sea-level. The districts visited appeared to be well watered and to have numerous running streams throughout them; in fact it appeared difficult to find many locations in them far removed from running water. Swamps and ponds were also found to be numerous in these districts. The mining camps and cotton-mill villages were invariably located near some running stream. This was generally true also of the homes of the pellagrins living in the rural districts, and even in the towns and cities visited running water was never far distant. Some of the cases reported to me were said to have developed at considerable distances from running water, but the exact distances were not learned.

A classification of the homes of the pellagrins personally visited is given below with reference to location:

A. With reference to population (at time of onset):	Number.
In a cotton-mill village.....	142
In a town or suburbs.....	92
In a coal-mining camp.....	24
In the country.....	58
In a city.....	7
Total.....	323

B. Distance from watercourses (at time of visit):	Number.
0 to 50 yards.....	31
50 to 100 yards.....	35
100 to 200 yards.....	49
200 to 500 yards.....	118
500 yards to 1 mile.....	51
1 to 3 miles.....	¹ 10
Exact distance not determined.....	29
Total.....	323

Of the remaining classes the clerical was probably the highest in the social scale, next the professional, and then the trade. In some of the cases among these classes, however, the environment and living conditions with reference to house and to personal hygiene appeared excellent and quite different from those of the great majority of the pellagrins personally visited. Throughout my work the finding of a pellagrin living under conditions which were above criticism was the exception and not the rule.

Economic condition.—After interviewing each pellagrin an estimate of the economic condition was made. A rough classification of these estimates of cases is given below:

Economic condition of pellagrins:	Number.
Poverty.....	258
Comfort.....	59
Affluence.....	6
Total.....	323
Sanitary condition of homes:	
Good.....	11
Fair.....	36
Bad.....	249
Not visited.....	27
Total.....	323

Food.—The collection of much accurate and detailed data on the subject of food used by the pellagrins previous to the onset of the disease presented many difficulties, which under the circumstances could not be surmounted. The attempted plan to collect, systematically, information concerning the various articles in most common use as articles of diet, their kinds, sources, quantity, and quality, had to be abandoned, as it was soon learned that this complete information could be obtained only in a very few instances. In many cases it was impossible to get even a meager account of what had been eaten, as the memory and powers of observation of these people seemed extremely defective when the character of their diet was inquired into, and in addition there was quite often a distinct and very evident reticence regarding such a subject so indicative of their reduced economic circumstances. The subject of food, it seems to me, is one of the most important considerations with which the pellagrologist has to deal, but the data presented here is by no means

¹ The homes of these 10 cases have been classified further with reference to distance from ponds or swamps as follows:

Distance from a pond or swamp:	
0 to 100 yards.....	7
100 to 500 yards.....	2
None near, but mosquitoes said to be present (Case SCG 165).....	1
Total.....	10

commensurate with the importance of the subject. The few facts which have been collected will be given with the hope that they will be taken only for what they are worth.

It was found that the great majority of the pellagrins in this series of cases had been subsisting almost exclusively upon food bought at the stores. One of the pellagrins expressed the situation to me by saying that he and his family "lived out of paper sacks," and this was literally true in many instances. The pellagrins, as well as the non-pellagrous inhabitants of the cotton-mill villages and coal-mining camps, were practically dependent upon small grocery stores for their food supply. In the cotton-mill villages there are usually located one or more grocery and general merchandise stores which are operated either by private individuals or, as is more often the case, by the milling companies. These stores are, of course, operated by the companies for the convenience of their employees and for their own profit, and it is needless to say that they are extensively patronized by the mill people. Necessarily the lines and quality of the goods carried by these stores are regulated largely by the finances, the demands, and the tastes of their patrons. Much of the stock handled by these stores seemed to be that which had undergone some process for its preservation, such as canning or desiccation, so that dried and canned goods, packed meats, and the like constituted a considerable proportion of their stock of groceries.

A similar dependence upon stores obtained among the coal mining class, and in many instances the commissary of the coal mining company was the sole source of supplies within miles and the entire food supply used by the families of the miners came out of it. Under conditions such as these, it will be readily realized how important is the part played by these stores as sole distributing agents. A list of articles having the largest sale at a coal mining company store which had been patronized by a number of people in whom pellagra had developed was made up for me by the storekeeper. The list is given here and may be taken as typical of the class of foods used by the great majority of the pellagrins in this series of cases. The list is as follows: "Bacon, lard, meal, flour, fresh meats, cabbage, potatoes, onions, pie peaches, table peaches, dried peaches, dried apples, canned corn, canned tomatoes, canned peas, canned salmon, canned kraut, hominy, canned blackberries, corned beef, potted ham, sausage, canned pumpkin, canned cherries, canned sweet potatoes, postum, coffee, tea, sugar, baking powder, and soda." It seemed to be the consensus of opinion of the physicians practicing among these people that most of them were not receiving the proper quality and quantity of food, and that in many of the families the food received hasty and incomplete culinary preparation, even when obtained in sufficient quantity.

Despite the rural location of their homes and the opportunities for raising much of their food, the above statements can be made with reference to the majority of the pellagrins of the agricultural class. A few of the families visited among this class had vegetable gardens, but only in a very few instances did these gardens furnish the majority of the food consumed by the families. Most of these families, although living in the country, depended to a remarkable extent upon small "crossroads" stores or upon stores in neighboring towns. Not a few of the pellagrins who had been born and reared in the country had apparently not developed pellagra until after they had moved into the environment of a village or town.

It must be said, however, that a greater variety and better character of food stuffs entered into the dietary of the pellagrins living under better conditions than among those living under economically poorer conditions. So far as my observations went with reference to food no constant difference was found to have existed between the diets of the pellagrous and the nonpellagrous members of the families.

Corn.—Each one of the pellagrins personally seen gave a history of the more or less regular use of corn products as articles of diet. Some of them acknowledged only a limited use of corn, while others said that they "had been raised on corn bread" or that they "had lived on corn bread and hominy." Hominy and meal seemed to be the forms of corn in most common use, and in all except three instances some of the meal used had been obtained from the stores. In most instances the corn meal used in the families had been obtained exclusively from the stores. The pellagrins of three families stated positively that all of the meal used in their families had been made from corn grown by them on their own farms.¹ It might be said, however, that the grist mills in these districts, for the most part, grind both locally grown and imported corn.² The wholesale and retail dealers also handle both kinds simultaneously, so that it was impossible to learn the relative amounts of each kind which had been used in the families in which pellagra had developed or to arrive at any definite conclusion as to the relative amounts of the locally grown and of the imported corn which had been used in the communities visited. It was learned, however, that a considerable proportion

¹ Case SCY 6. White female. Wife of a farmer who is also the proprietor of a small country store. Husband and 3 children not pellagrous at time of my visit.

Case SCG 105. White female. Wife of a farmer. Renting class. Husband and 7 children not pellagrous at time of my visit. Sister said to have died of pellagra.

Cases SCG 75, 76, and 77. Farmer and 2 children. Renting class. Wife and 2 other children not pellagrous at time of my visit. No known relationship to another case of pellagra. 15 miles from nearest town.

² By "locally grown" corn is meant corn which is consumed in the districts in which it was grown; by "imported" corn is meant that which had been grown in some of the great corn-growing States, ground at some of the large mills of the country and shipped out in large quantities to dealers. A distinction between these two classes of corn is made here, since both unground corn and meal are known to undergo change during storage and transportation, and especially during and after transportation into warmer climates. This phase of the subject has been ably discussed by Alsberg, Carl L., "Agricultural Aspects of the Pellagra Problem in the United States," New York Medical Journal, July 10, 1909.

of the corn consumed by the people in these districts had been grown in other States and had been "shipped in," either before or after grinding. In several of the districts it was reported to me that some of this imported meal had been condemned after a chemical examination of it had been made. In a number of instances the pellagrins described the condition of the meal at the time they had bought it at the stores as being "sour," "sorry," or "musty," but many of them considered the meal which they had been using as first class. It must be remembered that the districts furnishing this series of pellagra cases belong to the great corn-eating section of the country, where for many years corn, in one form or another, has been one of the main articles of diet for all classes, and where for many years the demand for corn has not been equaled by the local supply.

Water supply.—The source of the drinking water at the time of the onset of the disease in these cases was determined and is as follows:

Source.	Number of cases.	Source.	Number of cases.
Wells:		Well and spring.....	9
Bored.....	50	Creek and spring.....	2
Dug.....	109	Spring.....	26
City or town supply.....	62	Hydrant (creek and spring water).....	14
Well and city supply.....	12	Cistern (stored rain water).....	6
Creek.....	3	Varied.....	18
Well and creek.....	10		
Well, creek, and spring.....	2	Total.....	323

Relationship of cases to other cases.—Upon reflection it will appear evident that a full presentation of all possible relationships among these cases would have left very little to be done on the subject of epidemiology of pellagra. Such a presentation, however, would have required the combined skill of experts in many lines and would certainly have been a herculean task. On account of the preliminary nature of my work and my limited facilities only a small amount of data has been collected upon this subject. Some of the gross relationships with reference to several points have been put into the following classification:

	Number.
A. Number of cases occurring in families (same house):	
(a) Families having 1 case.....	264
(b) Families having 2 cases.....	23
(c) Families having 3 cases.....	6
(d) Families having 4 cases.....	2
(e) Families having 5 cases.....	1
B. Propinquity and contact (miscellaneous):	
(a) No known relation to another case of pellagra.....	91
(b) Previous to onset had temporary association (as visit) with another case of pellagra.....	24
(c) Onset while living in the immediate vicinity of a pellagrin.....	148
(d) Onset while living in the same house with a pellagrin.....	450
(e) Onset while living in a house previously occupied by a pellagrin of another family.....	10

C. Sources of food supply.—In nine of the communities which I visited and in which pellagra was prevalent an attempt was made to dis-

¹ Includes group A above.

cover some relationship among cases with reference to the sources of their food supply at the time when they developed the first symptoms of the disease. The sources of food supply at the time of recurrences of the disease were not considered, nor the sources of food supply of the many cases which were reported to me from these communities and which were not personally seen. The classification of stores given below as sources of food supply is based only on the facts obtained from the pellagrins personally seen, who had developed pellagra in these communities and had since remained there. On account of the unavoidable incompleteness of this small amount of data, it can not be considered as either incriminating or exonerating evidence, but may be of some value in a supplementary way.

	Number.
Stores having 1 case of pellagra to develop among its patrons.....	43
Stores having 2 cases of pellagra to develop among its patrons.....	13
Stores having 3 cases of pellagra to develop among its patrons.....	6
Stores having 4 cases of pellagra to develop among its patrons.....	4
Stores having 5 cases of pellagra to develop among its patrons.....	4
Stores having 7 cases of pellagra to develop among its patrons.....	2
Stores having 10 cases of pellagra to develop among its patrons.....	1
Stores having 13 cases of pellagra to develop among its patrons.....	1
Stores having 19 cases of pellagra to develop among its patrons.....	1

Relation of pellagra to the family.—A classification of the 296 families personally visited is given below with reference to the size of each family and to the number of pellagrins among its members. The number of families having the same number of members are arranged vertically and those having the same number of pellagrins are arranged horizontally.

Table showing pellagrous families classified according to the size of the family and the number of pellagrins in each.

Number of pellagrins in family.	Number of persons in family.										Total.
	1	2	3	4	5	6	7	8	9+	Un-known.	
	Number of families.										
1.....	5	31	41	50	50	22	20	12	20	13	264
2.....			1	7	2	7	2	1	3		23
3.....			1	1		3	1				6
4.....						1			1		2
5.....									1		1
Total.....	5	31	43	58	52	33	23	13	25	13	296

In this connection there might be mentioned a fact which seems to me to be of considerable importance. This fact is that in many instances where the family visited had one or more cases of pellagra some one or perhaps several other members of the family would be found to present signs and symptoms very suggestive of pellagra, but to an extent not sufficient for a positive diagnosis. These signs and symptoms in many instances seemed to differ from those presented

by the pellagrous member only in degree and not in kind. Among the symptoms in question may be mentioned mild gastro-intestinal or nervous disturbances, the presence of a beefy or of an abnormally red tongue. The previous histories of some of these cases were also very suggestive of pellagra. Persons presenting signs and symptoms such as these were also seen in several of the pellagrous communities who were not members of families having a definite case of pellagra. There were seen a great many of these borderline cases the diagnosis of which was not always made with ease. For purposes of advice and treatment these cases would undoubtedly be considered as early cases of pellagra, and in fact this diagnosis was the most probable one in the majority of instances, but for the purposes of my work they have not been considered as true cases of pellagra, on account of the element of uncertainty in the diagnosis. I have learned that some of these cases which were only suggestive of pellagra at the time of my visit have since developed the disease in pronounced form and succumbed to it, so without doubt it was the very early stages of the disease from which some, at least, of these persons were suffering at the time of my visit. The fact that many such cases exist is of considerable importance in considering the pellagra situation in a family or in a community, and, although it can not be considered as evidence definitely positive, it may, with propriety, it seems to me, be considered as data of an important collateral nature.

Relation of pellagra to procreation and heredity.—An attempt was made to collect some data which might shed light upon the questions of whether pellagra is hereditary or not and whether it has any effect upon the powers of procreation. Unfortunately very little data was obtained which might be used in drawing conclusions upon these points, but the data which have been collected will be presented without comment. Only the married female pellagrins who were personally seen and the pellagrous children under 10 years of age who were personally seen are considered here:

	Number.
Married female pellagrins.....	158
1. Who have never borne children.....	14
2. Who have borne children.....	135
3. Parturient history not obtained.....	9
	<hr/> 158

The 135 married female pellagrins who had borne children may be classified with reference to the sequence or priority of the onset of the disease to the birth of their last child, as follows:

	Number.
(a) Onset of pellagra in the mother longer than 1 year after birth of last child.....	50
(b) Onset of pellagra in the mother within 1 year after birth of last child.....	58
Condition of children at time of my visit:	
Apparently healthy.....	47
Poorly nourished.....	2
Dead.....	9
Pellagrous.....	0

	Number.
(c) Onset of pellagra in the mother within 1 year before birth of last child.....	18
Condition of children at time of my visit:	
Apparently healthy.....	14
Poorly nourished.....	2
Dead.....	2
Pellagrous.....	0
(d) Onset of pellagra in the mother longer than 1 year before birth of last child.....	9
Condition of children at time of my visit:	
Apparently healthy.....	6
Dead.....	2
Not seen; reported pellagrous.....	1

Among all of the female pellagrins who were personally seen 30 were with nursing infants at the time of my visit. The condition of these infants is given below:

Apparently healthy.....	24
Poorly nourished.....	3
With diarrhea.....	3
Pellagrous.....	0

The pellagrous children under 10 years of age may be classified with reference to the pellagrous or nonpellagrous condition of their parents at the time of my visit.

Pellagrous children under 10 years of age.....	38
1. With nonpellagrous parents.....	25
2. With one or both parents pellagrous.....	13
(a) Pellagra developed in parent before birth of child.....	0
(b) Pellagra developed in parent after birth of child.....	13

The ages of these children at the time they developed pellagra were 1 at 2 years of age, 3 at 4 years of age, 4 at 6 years of age, 1 at 7 years of age, 1 at 8 years of age, and 3 at 9 years of age.

[To be concluded in next issue.]